Journal of Advanced Veterinary Research

http://advetresearch.com/index.php/avr/index

Ultrasonographic Diagnosis and Clinical Evaluation of the Foreign Body Complications in the Compound Stomach of Cattle and Buffaloes

Effat E. El esawy*, Adel M. Badawy, Samy F. Ismail

Department of Surgery, Faculty of Veterinary Medicine, Benha University, Egypt.

ARTICLE INFO

Original Research

Accepted:
22 April 2015

Keywords:

Sonography
Clinical
Foreign body
Complications
Large ruminants

ABSTRACT

This study was aimed to detect and record the clinical and ultrasonographic findings of the different complications resulted from the foreign bodies lodged in the compound stomach of cattle and buffaloes. A total of 105 animals (37 cattle and 68 buffaloes) were subjected to study. Based on the clinical and ultrasonographic examination, animals were classified into; acute local reticuloperitonitis (ALRP) (15 cattle and 28 buffaloes), chronic local reticuloperitonitis (CLRP) (6 cattle and 14 buffaloes), acute diffuse reticuloperitonitis (ADRP) (5 cattle and 3buffaloes), reticular abscesses (RA) (4 cattle and 7 buffaloes), traumatic pericarditis (TP) (6 cattle and16 buffaloes) and liver abscess (one cattle). Results revealed that ALRP represented the highest percentage of 40.5% in cattle and 41.2 % in buffalos between the different complications of TRP. TP represented the second complications of higher incidence (16.2% in cows and 23.5% in buffalos). Liver abscess represented the lowest percentage (2.8%) and was recorded in cows only. The pregnant animals were affected more than the non pregnant. Clinical findings represented in systemic reaction and pain tests were commonly encountered in TRP and its complications. Some of the affected animals were negatively respond to metal detector test. Results of the present study indicated that the ultrasonographic examination provide a specific echogenic pattern for the different complications of TRP. It was concluded that, clinical examination only is not efficient to give accurate diagnosis of foreign body lodged in the reticulum and rumen and their complications. Ultrasonography is a safe, non invasive diagnostic confirmatory method that could be used for early detection of such conditions.

Introduction

Ultrasonography is considered to be the most safest, useful, reliable and confirmatory aid in diagnosis of traumatic reticuloperitonitis (TRP) and pericarditis. Ultrasonography is superior to radiography in evaluation of reticular contour, fibrinous deposits, abnormal gas/fluid accumulation and intra-abdominal masses (Senna *et al*., 2003).

Ultrasonography provided exact information concerning the various sequelae of TRP in cattle and buffaloes. Moreover, ultrasonography made it possible to determine the location and extent of the lesions accurately, and the site best suited for abdominocentesis and thoracocentesis (Saleh *et al*., 2008; Abdelaal, 2009; Abdelaal *et al*., 2009).

There are many potential causes of abdominal disorders in cattle and buffaloes. Traumatic reticuloperitonitis is a relatively common reason for abdominal surgery in both species. The importance of this disease is not only due to its higher prevalence among other digestive disorders (Maddy, 1954). There are, additional diagnostic techniques like ultrasonography are often helpful due to the difficulty in early prediction and difficulty in evaluation of its sequelae by physical examination (Abd El Raof *et al*., 2012).

The reticulum is the most cranial part of the four

*Corresponding author: Effat E. El esawy
E-mail address: dreffat777@gmail.com

ISSN: 2090-6277/2090-6269/

compartments, it is located between the 6th and 7th or 8th ribs. The greater part of it lies on the left of the median plane. The diaphragmatic surface is convex and lies against the diaphragm and liver. It is important that the reticulum is in contact with the diaphragm, which in turn is in contact with the pericardium and lungs. Foreign bodies such as nails and wire, which are often swallowed by cattle commonly lodge in the reticulum and sometimes perforate to the diaphragm (Abd El Raof *et al*., 2012).

Once a metallic foreign body perforates the reticular wall, clinical signs develop. These signs are extremely variable and influenced by the anatomic region of perforation within the reticulum, depth of perforation, associated abdominal or thoracic viscera injury by the perforating object, physical features of the causative object, and the affected cow stage of gestation or lactation. Metal detectors were used at one time to aid in the diagnosis of TRP (El-Sheikh, 1971). Ferrous metallic foreign bodies can be detected with metal detectors but the instruments are of limited use because most normal dairy cows are positive for metal over the reticular area (Braun *et al*., 1993).

The diagnosis of TRP is primarily based on history and clinical findings, although additional methods such as total and differential blood leukocyte counts, serum biochemical profiles, abdominocentesis, plain or contrast radiography, ultrasonography and exploratory laparotomy can be employed. In affected cattle, differential diagnosis can be difficult, especially in the initial evaluation (Abdelaal, 2009).

The signs of TRP are dependent on the site of reticular perforation and lesions caused by the foreign body in the surrounding areas (Habel, 1975; Abdelaal, 2009).

The condition is generally progressive and the clinical signs change as the disease progresses from the initial acute phase through a sub-acute to a chronic phase (Radostits *et al*., 2007). The present study was aimed to detect and record the clinical and ultrasonographic findings of the different complications resulted from the foreign bodies lodged in the compound stomach of cattle and buffaloes.

Materials and methods

Animals

One hundred and five animals (37 cattle and 68 buffaloes) with different complications of foreign body in the reticulum were examined at the Teaching Hospital, Faculty of Veterinary Medicine Benha University and at the Centres of Directorate of Veterinary Medicine in Menofia Governorate, Egypt. The animals were ranged in age from 3 to 12 years old and ranged from 300-600 kg in body weight.

Clinical Examination

Evaluation of the data concerning history, age, sex, breed, duration of illness, food intake, rumination, defecation, reproductive status, milk yield, signs of pain, coughing, regurgitation, presence or absence of tympany and body weight were collected. Rectal body temperature, heart rate, respiration rate, rumen motility and rectal examination was noted and performed (Jackson and Cockcroft, 2007). Foreign body detector (Hauptner Herberholz Germany) was used all over the ventrolateral and ventral wall of the abdomen and thorax to detect the metallic foreign bodies.

Ultrasonographic examination

Multi-frequency convex transducers of 3.5-5.0 MHz (Welled Ultrasound machine DP-3300 Vet, China, German technology and Logiq TM 180 GE Medical Systems: U.S.A) were used for examination of the different compartments of the compound stomach of the cattle and buffaloes.

The animals were prepared for examination through clipping and shaving of the hair on both sides of the ventral part of the lateral abdominal and thoracic wall. Coupling gel was spread on the area of the examination. Scanning was started from the ventral abdominal wall toward the intercostal spaces on both sides. The transducer was moved dorsoventrally on each intercostal space for accurate examination as represented in Fig. 1.

Post-mortem examination

The reticulum, rumen, heart, lung and pleura of emergency slaughtered animals after diagnosis of progressive complications of foreign bodies were examined for changes and perforation by foreign body.

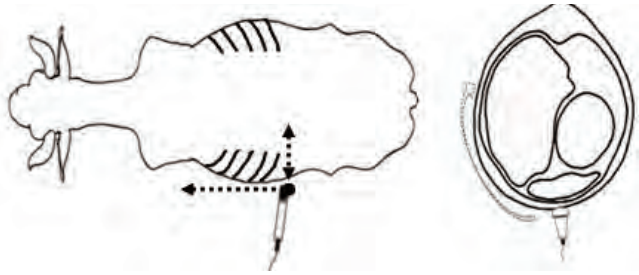

Fig. 1. Schematic representation for the placement and direction of the probe during examination of the compound stomach for the foreign body and its complications.

Table 1. Numbers and percentages of the animals suffering from foreign body complications in relation to age, sex and pregnancy (105 cases).

Variables		Cattle		Buffaloes	
		N	%	N	%
Total number		37	35.2	68	64.8
Age	3-6 years	15	14.2	27.0	25.7
	6-12 years	22	20.9	41.0	39.0
Sex	Male	2.0	1.9	3.0	2.8
	Female	35	33.3	65.0	61.9
Pregnancy	Non pregnant	6.0	5.7	7.0	6.6
	End of the mid trimester	11.0	10.4	13.0	12.3
	Last trimester	20.0	19.0	48.0	45.7

% = Percentage. N = Number of animals

Results

Clinical findings

A total number of 105 animals (37cattle and 68 buffaloes) were detected and recorded suffering from different complications of the foreign body (Tables 1 and 2).

These complications were described as acute local reticuloperitonitis (ALRP) (15 cattle and 28 buffaloes), chronic local reticuloperitonitis (CLRP) (6 cattle and14 buffaloes), acute diffuse reticuloperitonitis (ADRP) (5 cattle and 3 buffaloes), reticular abscesses (RA) (4 cattle and 7 buffaloes), traumatic pericarditis (TP) (6 cattle and16 buffaloes) and liver abscess (one cattle).

The clinical findings were recorded and evaluated (Tables 3, 4 and 5).

All examined animals in this study had reduced appetite, low milk yield and ruminal atony. Few animals had watery diarrhea. Additionally most of them had scanty faeces and ruminal tympany. Most of animals (36 cattle and 58 buffaloes) were positively reactive for the metal detector. Most cases of pericarditis had respiratory signs represented in, shallow rapid respiration, cough, dyspnoea. In more progressive cases of the TP there were protrusion of the tongue due to pain, delayed recumbancy and rising up of the animal, presternal oedema, jugular engorgement and pulsation and tremors in the area of anconeus muscle above the point of the elbow (Figs. 2a and 2b).

Table 2. Numbers and percentages of animals suffering from different complications of the foreign body.

Animals	Cattle (n=37)		Buffaloes (n=68)		Total number (n=105)	
	(N)	(%)	(N)	(%)	Cattle (%)	Buffaloes (%)
Foreign body complications						
ALRP	15.0	40.5	28.0	41.2	14.3	26.7
CLRP	6.0	16.2	14.0	20.6	5.7	13.3
ADRP	5.0	13.5	3.0	4.4	4.7	2.8
RA	4.0	10.8	7.0	10.3	3.9	6.7
TP	6.0	16.2	16.0	23.5	5.7	15.3
LA	1.0	2.8	-	-	0.9	-
Total number	37	100	68	100	35.2	64.8

ALRP: Acute local reticuloperitonitis; ADRP: Acute diffuse reticuloperitonitis; CLRP; Chronic local reticuloperitonitis; RA: Reticular abscess; TP: Traumatic pericarditis; LA: Liver abscess.

Table 3. Clinical findings (respiratory and cardiovascular) of different complications of TRP.

		Complications of TRP														
		ALRP		CLRP		ADRP		RA		TP		LA	Cattle		Buffaloes	
Animals		Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	(N)	(%)	(N)	(%)
Total Numbers		15	28	6	14	5	3	4	7	6	16	1	37	100	68	100
Respiratory and Cardiovascular Manifestations	Rise of body temperature	15	28	1	2	5	3	1	2	4	12	1	27	72.9	47	69.1
	Lowered body temperature	-	-	-	-	-	-	-	-	2	3	-	2	5.4	3	4.4
	Increased respiratory rate	11	16	-	-	4	3	-	-	5	11	-	20	54	30	44.1
	Decreased respiratory rate	2	5	1	-	-	-	-	-	1	2	-	4	10.8	7	10.3
	Increased heart rate	12		-	-	4	3	-	-	3	3	-	19	51.3	6	8.8
	Decreased heart rate	-	-	-	-	-	-	-	-	3	12	-	3	8.1	12	17.6
	Muffled heart sound	-	-	-	-	-	-	-	-	5	14	-	5	13.5	14	20.6
	Dyspnea	2	1	1	-	1	-	-	-	4	11	-	8	21.6	12	17.6
	Cough	3	2	1	-	1	-	-	1	2	6	-	7	18.9	9	13.2
	Oedema of the dewlap	-	-	-	-	-	-	-	-	5	14	-	5	13.5	14	20.6
	Jugular vein distension	-	-	-	-	-	-	-	-	5	14	-	5	13.5	14	20.6

ALRP: Acute local reticuloperitonitis; ADRP: Acute diffuse reticuloperitonitis; CLRP; Chronic local reticuloperitonitis; RA: Reticular abscess; TP: Traumatic pericarditis; LA: Liver abscess.

Table 4. Clinical findings (pain tests and metal detector test)) of different complications of TRP.

	Complications of TRP														
	ALRP		CLRP		ADRP		RA		TP		LA	Cattle		Buffaloes	
Animals	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	(N)	(%)	(N)	(%)
Withers pinch test	8	-	2	-	4	-	1	-	6	2	-	21	56.7	2	2.9
Stick test.	11	2	1	-	5	1	2	-	6	5	1	26	70.2	8	11.7
Inclined plane test	3	1	-	-	4	-	-	-	6	9	-	13	35.1	10	14.7
Positive metal Detector	15	23	6	11	5	3	3	5	6	16	1	36	97.2	58	85.2

ALRP: Acute local reticuloperitonitis; ADRP: Acute diffuse reticuloperitonitis; CLRP; Chronic local reticuloperitonitis; RA: Reticular abscess; TP: Traumatic pericarditis; LA: Liver abscess.

Table 5. Clinical findings (digestive manifestations) of different complications of TRP.

	Complications of TRP														
	ALRP		CLRP		ADRP		RA		TP		LA	Cattle		Buffaloes	
Animals	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	Buffaloes	Cattle	(N)	(%)	(N)	(%)
Digestive Disorders															
Ruminal atony	15	27	6	14	5	3	4	7	6	16	1	37	100	66	97
Reduced appetite	15	28	6	14	5	3	4	7	6	16	1	37	100	68	100
Diarrhea	4	13	1	1	3	1	-	1	2	5	1	11	29.7	21	30.8
Rumen Tympany	2	4	3	6	2	1	-	-	-	-	-	7	18.9	11	16.1
Scanty feces	6	9	2	4	-	2	1	2	3	9	-	12	32.4	26	38.2
General Disorders															
Emaciation	3	6	5	11	3	2	2	3	2	4	1	16	43.2	26	38.2
Recumbancy	-	-	-	-	-	-			2	2	-	2	5.4	2	2.9

ALRP: Acute local reticuloperitonitis; ADRP: Acute diffuse reticuloperitonitis; CLRP; Chronic local reticuloperitonitis; RA: Reticular abscess; TP: Traumatic pericarditis; LA: Liver abscess.

Fig. 2a. A Buffalo suffering from traumatic pericarditis (TP) manifested, distended jugular vein. A): Edema of the brisket, Dyspnea. B): Protrusion of the tongue and finally recumbent after the pressure pain test had applied (C).

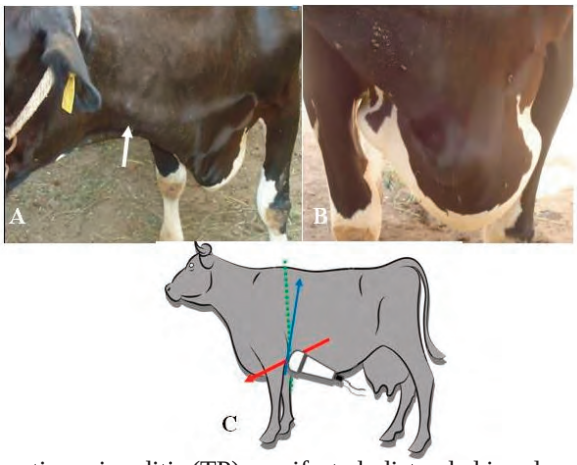

Fig. 2b. A cow suffering from traumatic pericarditis (TP) manifested; distended jugular vein (A) , edema of the brisket (B). Placement of the curvilinear 3.5 MHz probe on the area from third to sixth intercostal spaces (C)

Ultrasonographic findings

Ultrasonographic examination of animals suffering from ALRP revealed areas of mixed echogenicity of fibrin deposits between the reticulum and abdominal wall. Foreign body appeared according to its shape and direction as linear, curved or round hyperechoic spots with comet tail artifacts in the most cases (Figs. 3 and 4). CLRP appeared with more hyperechoic bands of fibrin than in the ALRP with an irregular appearance of the reticular wall (Figs. 5 and 6). ADRP had a widely extended echogenic strands and hypoechoic peritoneal fluid on the floor of ventral abdominal wall (Figs. 7 and 8). Reticular abscesses appeared as circumscribed areas of mixed echogenicity surrounded by a hyperechoic membrane of varying sizes (2-10 cm) (Figs. 9 and 10). Liver abscess was recorded in one cow and appeared as a hypoechoic area of 11.4 cm in diameter surrounded by echogenic capsule with hypoechoic area of infiltration (Fig. 11).

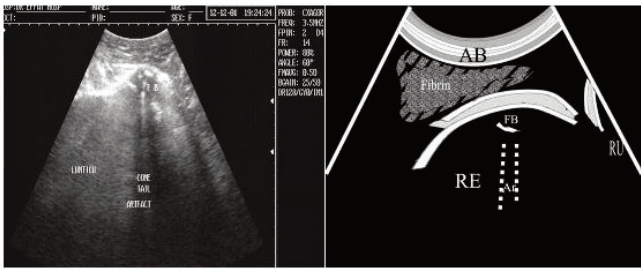

Fig. 3. Utrasonographic image (left) and its schematic representation (right) of a cow affected with ALRP. Notice; echogenic fibrin debris between the reticulum (Re), rumen (RU) and abdominal wall (AB) with hyperechogenic forgien body (FB) with comit-tail artifact (Ar). (Using 3.5 MHz Transducer and Dp: 10 cm).

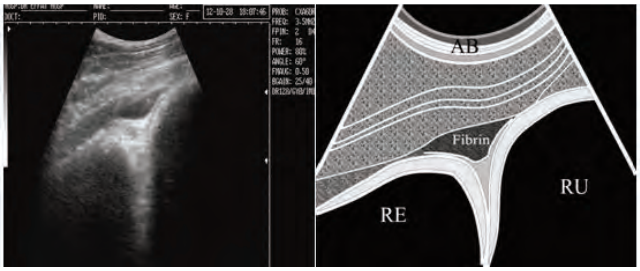

Fig. 4. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with ALRP. Notice; echogenic fibrin debris between the reticulum (RE), rumen (RU) and abdominal wall (AB). (Using 3.5 MHz Transducer and Dp: 10 cm).

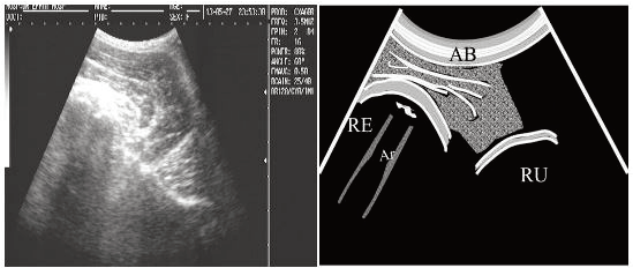

Fig. 5. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with CLRP. Notice; hyperechogenic fibrous bands and echogenic area of large quantity of accumulated fibrin clots between the reticulum (Re), rumen (RU) and abdominal wall (AB) with hyperechogenic linear foreign body (FB) with comit-tail artifact (Ar). (Using 3.5 MHz Transducer and DP: 15 cm).

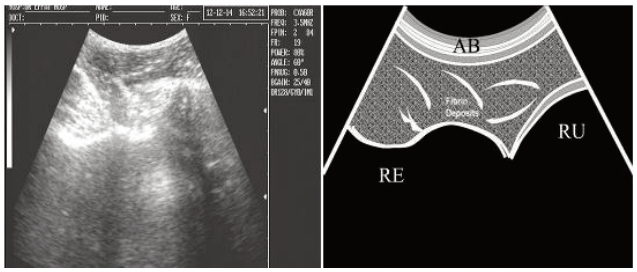

Fig. 6. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with CLRP. Notice; wide hyperechogenic area with hyperechoic fibrous tissue bands between the reticulum (Re), rumen (RU) and abdominal wall (AB). (Using 3.5 MHz Transducer and DP: 10 cm).

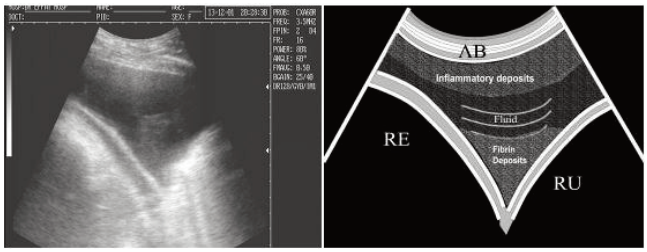

Fig. 7. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with ADRP. Notice; large area of hyperechogenicity of fibrous bands and echogenic area of large quantity of inflammatory deposits and fluid between the reticulum (Re), rumen (RU) and abdominal wall (AB) (Using 3.5 MHz Transducer and DP: 15 cm).

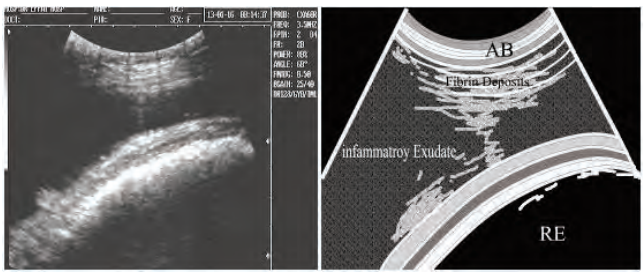

Fig. 8. Ultrasonographic image (left) and its schematic representation (right) of a buffalo affected with ADRP. Notice; large area of hyperechogenicity of fibrin deposits and anechogenic area of inflammatory exudates and fluid between the reticulum (Re) and abdominal wall (AB) (Using 3.5 MHz Transducer and DP: 10 cm).

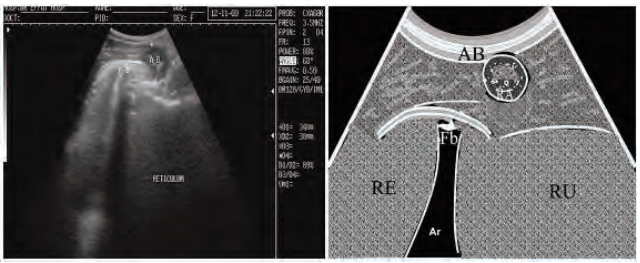

Fig. 9. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with RA. Notice; hypoechognic circumscribed area of inflammatory exudates surrounded with hyperechoic capsule in a large area of mixed echogenicity between the reticulum (Re), rumen (RU) and abdominal wall (AB). The foreign body appeared hyperechoic area with comit-tail artifact. (About 3.4cm x 2.6 cm in size). (Using 3.5 MHz Transducer and DP: 15 cm).

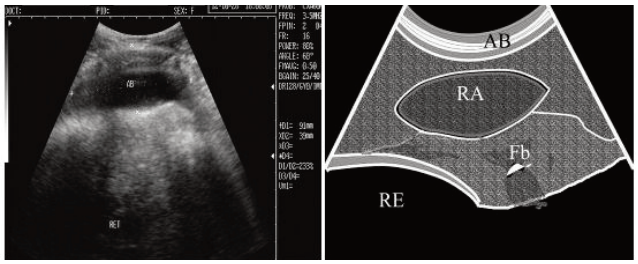

Fig. 10. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with RA. Notice; hypoechognic circumscribed area of inflammatory exudates surrounded with hyperechoic capsule in a large area of mixed echogenicity between the reticulum (Re) and abdominal wall(AB). (About 4 cm x 5.2 cm in size)(Using 3.5 MHz Transducer and DP: 10 cm).

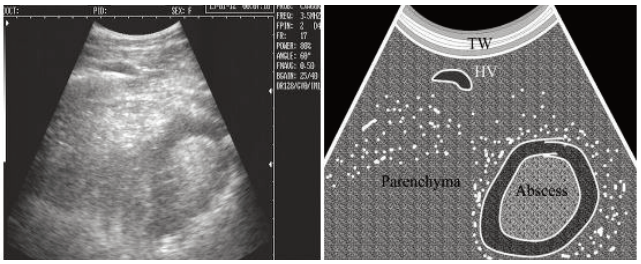

Fig. 11. Ultrasonographic image (left) and its schematic representation (right) of a cow affected with liver abscess (LA). Notice: mixed area of echogenicity representing inflammatory exudates and pus the surrounded with hyperchoic thickened fibrous tissue capsule within the liver parenchyma hepatic vein (HV) appear as hyperechoic circular band with anaechoic content of blood. (Using 3.5 MHz Transducer and DP: 10 cm).

Ultrasonographic examination of cases with traumatic pericarditis revealed the presence of turbid pericardial fluid with mixed echogenicity in the pericardial sac. In the more progressive cases of the pericarditis, the sonographic appearance (Echocardiography) had an extensive hyperechoic fibrinous strands in the pericardial sac (Figs. 12 and 13). Pericardial effusion might be resulted in separation

of the pericardium from the epicardium, especially over the ventricles. There was a large amount of hypoechogenic to echogenic pericardial fluid and echogenic deposits and strands of fibrin between the pericardium and the epicardium. In few cases, strands of fibrin were seen floating in the fluid between the epicardium and pericardium. Normally, the pericardial layer did not seen in healthy animals, but in the affected animals, it was typically seen as a thick echoic membrane surrounding the heart. Depending on the amount of fluid, the cardiac muscles were hypertrophied and ventricles were moderately to severely compressed. Minute, bright hyperechoic pinpoint echoes representing free gas were visualized in pericarditis this indicated septic pericarditis.

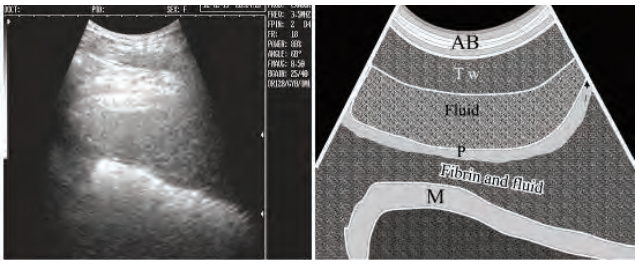

Fig. 12. Ultrasonographic image (left) and its schematic representation (right) of a buffalo affected with TP. Notice; hypoechoic area of inflammatory exudates in the pericardium (P) and the surrounded with echogenic fibrous bands between the pericardium (P) and myocardium (M) flids accumulated between the pericardium (P) and abdominal wall(AB). (Using 3.5 MHz Transducer and DP: 10 cm).

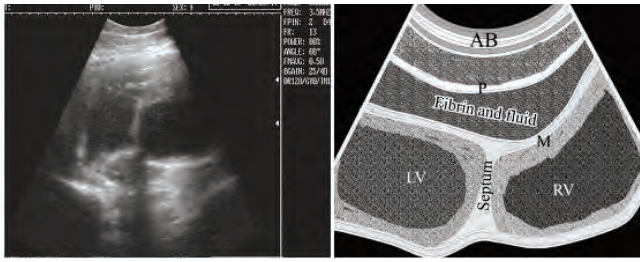

Fig. 13. Ultrasonographic image (left) and its schematic representation (right) of a buffalo affected with TP. Notice; hypoechoic area of inflammatory exudates strands of fibrin are seen floating in the fluid between the epicardium and pericardium (P) and the surrounded with hyperchoic appearance of thickened pericardium (P). Fluids accumulated between the pericardium (P) and abdominal wall (AB). There were hypertrophied myocardial muscles of the left and right ventricles. LV and RV) (Using 3.5 MHz Transducer and DP: 15 cm).

Foreign body detector (metal detector test) was positive in all cows and 23 buffaloes diagnosed suffering from ALRP, while this test was negative in 5 buffalos as they were very fatty. Ultrasonographically, the condition was diagnosed in all animals and could be differentiated into ALRP with abscess and ALRP without abscess according to its ultrasonographic appearance. One cow and two buffaloes were recorded with hot, fluctuating swelling behind the point of elbow joint at the left thoracic wall. One cow and one buffalo were recorded with elongated hot painful, fluctuating swelling just behind the umbilicus.

Six cows and 11 buffalos were positive to the metal detector while three buffaloes were not reactive. Ultrasonographic examination by placing the transducer just behind the xiphoid cartilage was revealed characteristic picture of CLRP. In few cases, the foreign body was not clearly visible due to its impedance in the deposits of fibrous tissue.

Five cows and three buffaloes were positively responded to metal detector. All of these cases were differentiated and diagnosed ultrasonographiclly as ADRP. Reticular abscess was diagnosed in 4 cows and 7 buffaloes. Metal detector test was positive in three cows and five buffalos. Ultrasonographically, all these affected animals were revealed an echogenic capsule surrounded by a hypoechogenic or nonechogenic mass ranging from 20 mm to 120 mm in diameter.

Metal detector test was positive in a cow that had been clinically diagnosed suffering from liver condition. Hepatic ultrasonographic examination revealed liver abscess visualized in the area between the 7th to 12th intercostal spaces (area of the right lobe of the liver).

All clinically diagnosed animals suffering from TP were positively reactive to the metal detector especially when the probe (Hand piece) was placed over the area behind the left elbow. Ultrasonographic examination of the heart (Echocardiography) was revealed a diagnostic characteristic pattern of the foreign body enclose to the pericardium.

Postmortem findings

The postmortem findings in the emergency slaughtered animals that suffered from either progressive case of acute local traumatic reticuloperitonitis were characterized by presence of the foreign body penetrating the reticular wall with formation of circumscribed area of suppurative inflammation, abscess formation and granulation

tissue formation (Figs 14, 15). While in cases which were slaughtered due to chronic local reticuloperitonitis there was a large area of fibrous tissue adhesion between the reticulum and adjacent organs (Fig. 16). In cases of traumatic pericarditis, the postmortem findings represented in pericardial effusion with turbid gelatinous fluid containing flacks of fibrin strands with extension to the surrounding pleura and mediastinum in few cases. The heart appeared whitish red with adhesion of some fibrin strands (Fig. 17).

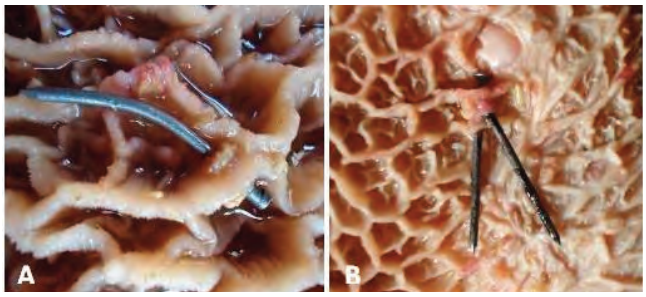

Fig. 14. Postmortem examination of the reticulum of a cow (A) and buffalo (B) affected with ALRP. Notice the entrapment of the sharp metallic foreign body and perforation of the reticular wall by the foreign body.

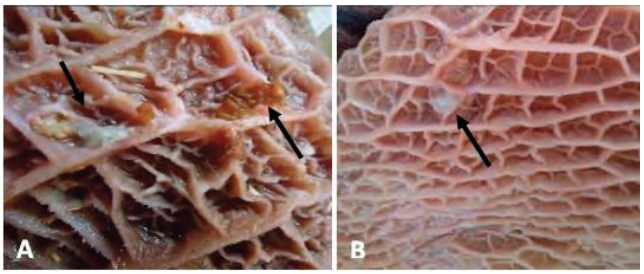

Fig. 15. Postmortem examination of the reticulum of a buffalo (A) and cow (B) affected with, reticular abscess with pus protruded from the reticular wall, notice ruptured reticular wall with the signs of necrosis (arrows).

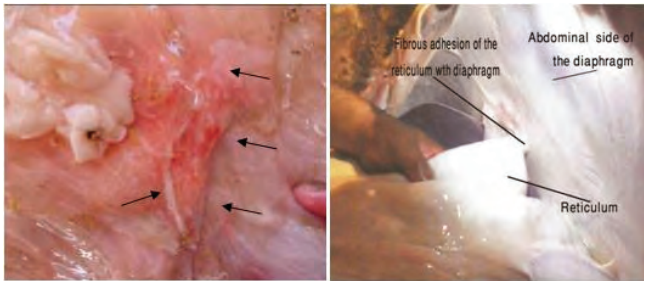

Fig. 16. Postmortem examination of the reticular wall in relation to the abdominal wall and rumen in a buffalo affected with CLRP. Notice the adhesions by the fibrous tissue bands and extensive deposition of fibrinous tissue on the reticular surface.

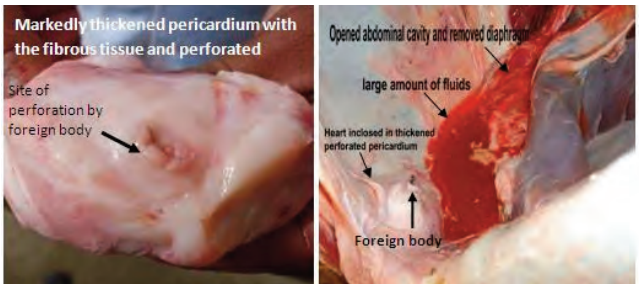

Fig. 17. Postmortem examination of the abdominal and thoracic cavity of a cow suffering from TP. Notice the excessive fluid in the abdominal cavity, (right) the heart and pericardium was visualized after removal of the diaphragm and the foreign body appeared perforating a thickened pericardium, and after removal of the foreign body (left).

Discussion

Unlike sheep and goats, cattle and buffaloes do not use their lips to discriminate between very fibrous feed and metallic objects in feedstuffs (Fubini and Divers, 2008). The method of food prehension in this species is by tongue with the included foreign bodies. So, sharp metallic foreign bodies were implicated as a cause in most of the digestive disorders in cattle and buffaloes. When these foreign bodies ingested by these animals enclosed with their food and penetrate the reticular wall as a result of the ruminal contractions and lead to many serious complications (Misk *et al*., 2001).

The incidence of TRP was higher in animals above 6 years of age (20.9% cattle and 39 % buffaloes). Females represent the higher percentage (33.3 % in cattle and 61.9% in buffaloes) among affected animals. This might be due to the most of females are raised for breeding cycles in the farms and sporadic individuals and this permit the animals live long periods up to 12 years and increasing the risk of female affected than males. Mostly, the males go to fattening and feed on definite rations of low forage. The fattening periods are short and consequently the risk of the affection decreased in males.

The TRP represented one of the most common complications that were recorded in the present study. Its incidence in cattle was less than in buffaloes, this finding agreed with Braun and Gotz (1994); Abdelaal (2009) and Abdelaal *et al*. (2009).This might be due to the difference in the management of cattle and buffaloes, as the cattle mostly in small or large scale farms with many feeding precautions. While, buffaloes are individually raised or in small farms without feeding pre-

cautions. These findings agreed with Abdelaal (2009) and Abdelaal *et al*. (2009) as they attributed that to increase number of buffalo's population than cows in Egypt.

In our study, the pregnant animals were affected more than the non pregnant. The third trimaster of pregnancy was the period of the higher incidence of these complications especially TRP, this might be attributed to the progress of pregnancy, as the gravid uterus pushes the foreign body forward toward the reticulum leading to TRP. This result has been supported by Braun *et al*. (1993); Abdelaal (2009) and Braun *et al*. (2001).

Most of the affected animals in the present study revealed positive reactions to metal detector, these findings were agrees to those reported by Braun *et al*. (1993); Rebhun (1995); Misk *et al*. (2001); Abdelaal (2009) and Abdelaal *et al*. (2009). Who described that metal detector may give negative results in animals affected with TRP, that it is more indicative in buffaloes than in cows. Buffaloes swallow more foreign materials when they suffered from hypophosphataemia (Weaver *et al*., 2005).

Several complications for TRP were recorded in this study including; ALRP represented the highest percentage of 40.5% in cattle and 41.2 % in buffalos between the different complications of TRP. TP represented the second complications of higher incidence (16.2% in cows and 23.5% in buffalos) followed by CLRP (16.2% in cows and 20.6 in buffalos), RA (10.8 % in cows and 10.3% in buffalos) and then ADRP (13.5 % in cows and 4.4% in buffalos). Lastly, liver abscess represented the lowest percentage (2.8%) and was recorded in cows only. This finding is in contrary to that reported by Abdelaal (2009) and Abdelaal *et al*. (2009). Who reported that TP constituted the highest prevalence of the different complications of TRP. On the other hand, results agreed with that reported by Andrews *et al*. (2004); Radostits *et al*. (2007); Abdelaal *et al*. (2009) and Abd El Raof (2012) and disagreed with that reported by Sojka *et al*. (1990). Who described that in industrialized countries, metallic foreign bodies are present in the reticulum in more than 90% of healthy animals.

The present study revealed that ALRP, CLRP, ADRP, RA and TP were the most commonly encountered foreign body complications diagnosed by ultrasonographic examination. These results are similar to those reported by Saleh *et al*. (2008); Abdelaal (2009) and Abdelaal *et al*. (2009).

In regards to ultrasonographic examination of animals suffering from ALRP, the results revealed areas of mixed echogenicity of fibrin deposits between the reticulum and abdominal wall, which are similar to Abdelaal (2009); Abdelaal *et al*. (2009); Ghanem (2010) and Abd El Raof *et al*. (2012) in cows and buffaloes.

Foreign body appeared as linear, curved or round hyperechoic spots with comet tail artifacts. These results disagreed with those reported by Senna *et al*. (2003); Andrews *et al*. (2004); Randhawa *et al*. (2009); Ghanem (2010), who stated that foreign bodies and magnets cannot usually be seen in the reticulum because of the gas content.

ADRP was characterized by widely extended echogenic strands and hypoechoic peritoneal fluid on the floor of ventral abdominal wall. Large area of hyperechogenicity of fibrous bands and echogenic area of large quantity of inflammatory deposits were diagnosed indicating extensive fibrin deposition between the reticulum and abdominal wall, especially in the anterior ventral part of the abdominal cavity. These inflammatory exudates might be extended posteriorly behind the umbilicus and could be reached to the area over the mammary gland. Similar findings were reported by Abdelaal (2009) and Abd El Raof *et al*. (2012). Ultrasonograpically, RA appeared as circumscribed areas of mixed echogenicity surrounded by a hyperechoic membrane of varying sizes (2-10 cm). These observations agreed with Braun *et al*. (1998). While, LA was recorded in one cow and appeared as a hypoechoic area of 11.4 cm in diameter surrounded by echogenic capsule with surrounding hypoechoic area of infiltration. This finding was supported by Radostis *et al*. (2007).

Ultrasonographic findings of TP were represented by mixed echogenicity in the pericardial sac. This might be due to presence of turbid pericardial fluid, which in more progressive cases of the pericarditis, appeared as extensive hyperechoic strands in the pericardial sac. These findings are similar to those reported by Braun (2009); Abdelaal (2009) and Abdelaal *et al*. (2009). Large area of hyperechogenicity of fibrous bands and echogenic area of large quantity of inflammatory deposits were diagnosed indicating extensive fibrin deposition between the reticulum and abdominal wall, especially in the anterior ventral part of the abdominal cavity. These inflammatory exudates might be extended posteriorly behind the umbilicus and could be

reached to the area over the mammary gland.

In the present study, most the affected animals were positive to metal detector test except 11 animals (one cow and ten buffalos). These findings are in contrast to those recorded by Abdelaal *et al*. (2009) and Abd El Raof (2012). Who reported that all the affected animals positively responded to metal detector. But it is in agreement with El-Sheikh (1971), who stated that, the metal detector gave positive results in traumatic and non traumatic cases but may give negative result as in cases of traumatic pericarditis. These might be attributed to the highest thickness of the body wall especially in fatty animals that negative reactive to metal detector.

During examinations of the admitted animals some of them were positive reacted to metal detector without evidence of clinical signs of TRP. This might be due to the foreign body lodged in the reticulum is not sharp and not cause any harm. Ultrasonographic examination of the positively reacted cases revealed the different complications of the TRP conjoined with the evidenced clinical signs of the affection. In the present study, some affected animals did not respond to metal detector while ultrasonographic examination confirm their affection, this finding is supported by Randhawa *et al*. (2009), who reported that metal detector may give negative results in animals affected with TRP, that it is more indicative in buffaloes than in cows. This finding is also supported by Goddard (1995), who reported that, during the ultrasonographic examination, the ultrasound transducer is placed in contact with the body surface, the sound waves pass into the tissues. Acoustic impedance means the different resistance to the passage of sound into the different tissues. Whenever, the sound waves meet an interface between two tissues of differently acoustic impedance, part of the sound is reflected and part continues on into deeper tissues. A large part of the sound is reflected (returning echoes) and detected by the same transducer. When the crystals were stricken by the returning echoes, it vibrates again and converts these echoes into electrical energy. These signals are analyzed according to the strength and depth of reflection, and displayed on a screen as an image. The ultrasound is dependent on the frequency of the sound waves, higher frequency provide greater detail (Good resolution), but poor tissues penetration and lower frequency provides greater tissues penetration but low resolution (Nyland *et al*., 1995).

Conclusion

Clinical evaluation of the foreign bodies in the rumen and reticulum of cattle and buffaloes could not provide exact information for accurate diagnosis; whereas, ultrasonography is a safe and non invasive diagnostic confirmatory method that could be used for early detection of such conditions. In addition, it was more confirmatory than metal detector, as not all animals positively reacted to metal detector were affected with TRP, and also not all the negatively reacted were free from TRP complications. Ultrasonography could be useful in detection and determination of the shape and extent of the foreign body. Ultrasonography easily differentiate the type and extent of TRP and its complications. Periodical using of ultrasonography is recommended as a confirmatory diagnostic and alternative method to ordinary routine tests and metal detector test for early detection and diagnosis of the foreign bodies in the compound stomach of cattle and buffaloes and their complications.

Acknowledgement

The authors would like to thanks my supervisors about their efforts during preparing this article. Grateful thanks for Prof. Dr. Abd El Salam El Azzab for his valuable aid in preparing the statics of this study. The authors would like to Acknowledge the following sites www.eul.edu.eg and www.bu.edu.eg.

References

Abd El Raof, M., 2012. Surgical Gastric Disorders in Cattle With Relation To Infertility; M.V.Sc. thesis, Zagazig. University, Egypt.

Abd El Raof, M., Samy, M.T., Omar, M.S., Abdel Maboud, M., 2012. Traumatic Reticuloperitonitis (TRP) and its sequelae in cattle and buffaloes. Zagazig.Veterinary Journal 40(4), 1-13.

Abdelaal, A.M., 2009. Advanced Studies on Traumatic Reticulopertonitis in Cattle. Ph.D thesis, Zagazig. University, Egypt.

Abdelaal, A.M., Floeck, M., El Maghawry, S., Baumgartner, W., 2009. Clinical and ultrasonographic differences between cattle and buffaloes with various sequelae of traumatic reticuloperitonitis. Veterinaria Medecinia 54 (9), 399–406.

Andrews, A.H., Blowey, R.W., Boyd, H., Eddy, R.G., 2004. Bovine Medicine, Diseases and Husbandry of Cattle.

2nd ed. Ames, Iowa: Blackwell Science Ltd., pp. 841-843.

Braun, U., Gotz, M., 1994. Ultrasonography of the reticulum in cows. American Journal Veterinary Research 55 (3), 325-332.

Braun, U., 2009. Traumatic pericarditis in cattle: Clinical, radiographic and ultrasonographic findings. The Veterinary Journal 182,176–186.

Braun, U., Gotz, M., Marmier, O., 1993. Ultrasonographic findings in cows with traumatic reticuloperitonitis. Veterinary Record 133, 416-422.

Braun, U., Iselin, U., Lischer, C., Fluri, E. 1998. Ultrasonographic findings in five cows before and after treatment of reticular abscesses. Veterinary Record 142, 184-189.

Braun, U., Schweizer, T., Pausterla, N., 2001. Echocardiography of the normal bovine heart: technique and ultrasonographic appearance. Veterinary Record 148, 47-51.

El-Sheikh, A.H., 1971. Traumatic reticulitis in buffaloes. Egyptian Veterinary Medical Journal 19 (19), 3-22.

Fubini, S., Divers, T.J., 2008. Non-infectious diseases of the gastrointestinal tract. In: Rebhun's Diseases of Dairy Cattle (Divers, T.J. and Peek, S.F., editors), 2nd ed., Saunders Philadelphia. pp. 130 – 199.

Ghanem, M.M., 2010. A comparative study on traumatic reticuloperitonitis and traumatic pericarditis in Egyptian cattle. Turkish. Journal of Veterinary and Animal Science 34(2), 143-153.

Goddard, P.J., 1995. General principles, chapter 1, In Veterinary Ultrasonography by Goddard, PJ. Cab. International, UK. pp. 12-32

Habel, R.E., 1975. Ruminant digestive system. In: Getty, R. (editor); the Anatomy of the Domestic Animals; 5th ed. W.B.; Saunders Company. pp. 884- 902.

Jackson, P.G.G., Cockcroft, P.D., 2007. Clinical examination of farm animals. Iowa State Press, a Blackwell Publishing Company, 2121 State Avenue, Ames, Iowa , USA.

Maddy, K.T., 1954. Incidence of perforation of the bovine reticulum. Journal of the American Veterinary Medical Association 124, 113–115.

Misk, N., Semieka, M., Ali, S., 2001. Varieties and sequellae of ingested foreign bodies in buffalo and cattle. Assiut Veterinary Medical Journal 46, 250–273.

Nyland, T.G., Mattoon, J.S., Wisner, E.R., 1995.Physical principles, instrumentation. In veterinary diagnostic ultrasound by W.B. Saunders Company , Philadelphia London. pp. 3-18.

Radostits, O.M., Gay, C.C., Hinchcliff, K.W., Constable, P.D., 2007. Veterinary Medicine: A Textbook of the Diseases of Ccattle, Horses, Sheep, Pigs and Goats, 10th edition. Saunders Elsevier, Philadelphia.

Randhawa, C.S., Randhawa, S.S., Uppal, S.K., 2009. Plasma mineral status of buffaloes in Punjab. Indian Journal of Animal Science 79 (10), 1024 – 27.

Rebhun, W.C., 1995. Diseases of Dairy cattle. Philadelphia, Williams and Wilkins; 113-116.

Saleh, M.A., Rateb, H.Z., Misk, N.A., 2008. Comparison of blood serum proteins in water buffaloes with traumatic reticuloperitonitis and sequelae. Research in Veterinary Science 85 (2), 208-213.

Senna, N.A., El-Ghoul, W.S., Saleh, I.A., Berbish, E.A., 2003. Clinicopathological, ultrasonographic and pericardiocentesis findings in cattle and buffaloes with traumatic reticuloperitonitis and pericarditis. Veterinary Medical Journal Giza 51 (3), 381-401.

Weaver, D., Steiner, A., Guy St Jean, 2005. Bovine surgery and lameness, 2nd ed.; Blackwell Publishing. pp. 75-139.